

Global Energy Management System Implementation: Case Study

China

Pacific (Panyu) Textiles Limited

China's first textiles mill to be ISO 50001 certified



Pacific (Panyu) Textiles Limited, China

Business Case for Energy Management

Modern textiles manufacturing can trace its roots to the dawn of the Industrial Revolution, making it one of the oldest industries in the world. Early impacts of industrialization included environmental pollution in the form of smoke and chemical discharges to waterways. With this in mind, Pacific Textiles Holdings Limited established itself in Hong Kong in 1997 with the goal of building production facilities that worked with the environment – not against it. Initial building design at the manufacturing plant in Panyu, China, took advantage of natural ventilation; heat recovery from wastewater was also a critical component of conservation programs; and investments in the most energy and water efficient airflow dyeing machines were undertaken. These initiatives planted the seeds for energy efficiency that only needed the proper management system to yield bountiful energy savings.

Before implementing ISO 50001, Pacific Textiles had already implemented ISO 14001 as an environmental

management system, but had not yet established an energy management system. Therefore, when China started promoting the GB/T23331 energy management system, Pacific Textiles joined as one of three pilot manufacturers from the textiles industry.

“Initially we focused on reducing our environmental impact due to cost savings; we later recognized the societal benefits as well. Disciplined energy management continues our longstanding philosophy on conservation.”

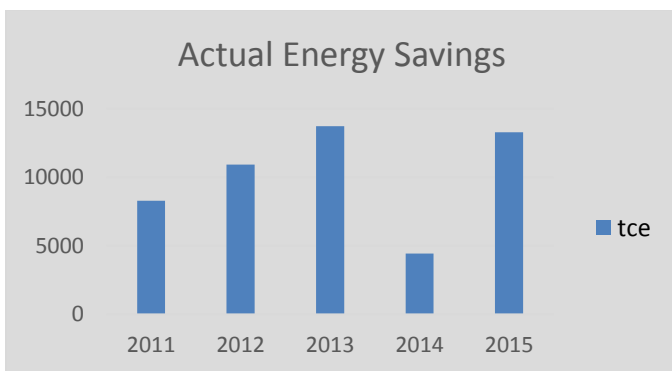
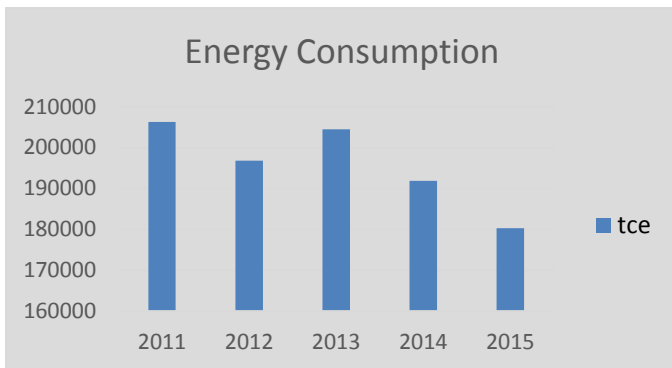
—Wan Wai Loi, Chairman and CEO

Case Study Snapshot	
Industry	Textiles
Product/Service	Knitted fabrics
Location	Panyu, China
Energy Management System	ISO 50001
Energy Performance Improvement Period	2011-2015 (12FYP)
Energy Performance Improvement (%) over improvement period	19%
Total energy cost savings over improvement period	\$4.89 million USD
Cost to implement EnMS	\$0.78 million USD
Payback period (years) on EnMS implementation	0.8
Total Energy Savings over improvement period	1,187,375 (GJ)
Total CO ₂ -e emission reduction over improvement period	108,902 (Metric tons)

After obtaining GB/T23331 certification in 2011, Pacific Textiles immediately began work on implementing ISO 50001 in order to gain international recognition for implementing an energy management system. In 2013, Pacific Textiles became the first textiles manufacturer in China to receive ISO 50001 certification.

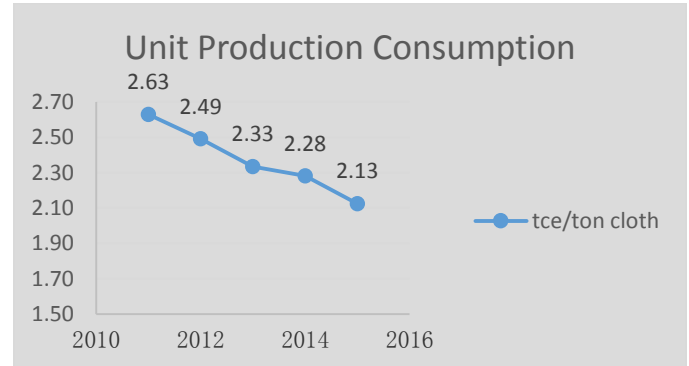
Business Benefits Achieved

Implementing ISO 50001 has provided Pacific Textiles with a framework that enables the understanding of its energy usage that can subsequently help to improve energy performance. During China's 12th Five Year Plan (12FYP) period, which is from 2011-2015, energy savings amounted to 50,642 metric tons of standard coal equivalent (tce) and 108,902 metric tons of CO₂ emissions were avoided.



Energy intensity is a key economic measure for determining the energy efficiency of a nation. China's metric is expressed in terms of tce/10,000 Yuan. During the 12FYP, China's goal was to reduce energy intensity by 16%, however Pacific Textiles was able to reduce energy

intensity by 31%. Pacific Textiles reported energy intensity as low as 0.36tce/10,000 Yuan, significantly below the national target of 0.68tce/10,000 Yuan.



As a direct result of implementing ISO 50001 and the resulting energy savings, Pacific Textiles has won a number of national awards including:

1. Ministry of Water Resources Award for Water Efficiency – 2017/12/28 – 1 of 11 enterprises in China to be awarded this distinction
2. China National Institute of Standardization Award for Excellent Energy Management – 2017/5/25 – 1 of 10 enterprises in China to be awarded this distinction
3. Ministry of Industry and Information Technology Award for Cleaner Production – 2013/8/12 – 1 of 44 enterprises in China to be awarded this distinction
4. China National Textile And Apparel Council (CNTAC): 2017 Advancement of Green Enterprises in Textiles
5. Guangzhou Nansha District: Outstanding Enterprise for Energy Management System Results

Major awards from the international community include:

1. National Resources Defense Council (NRDC): Best Economic Return – 2014, Most Innovative Overall Improvement (Guangdong) – 2014
2. British Standards Institution (BSI): 2014 Excellence Award, Energy Management Pioneer Award – 2011

Since implementing ISO 50001, Pacific Textiles has actively carried out research on reducing our carbon and water footprint in conjunction with local research institutes. In addition, we have joined standards setting boards to aid in the formulation of national standards.

We have also continued our leadership role in industry trade groups, actively promoting the importance of energy conservation. Some of these activities include:

1. Research on the Carbon Footprint of Textiles Enterprises with the China National Institute of Standardization (CNIS)
2. Research on the Water Footprint of Textiles Enterprises with CNIS
3. Participation in the authoring of the Discharge Standard of Air Pollutants for the Textiles Printing and Dyeing Industry
4. Participation in the authoring of the Accounting and Reporting Requirements for Greenhouse Gas Emissions in Textiles Enterprises

EnMS Development and Implementation

Organizational

Energy management has been firmly embedded into the organization, with managers from every department being fully accountable for their energy usage. The chairman of the board personally leads the Engineering Steering Committee Meeting every month and one of the main agenda items is to discuss issues related to energy use and energy savings. All department heads attend this meeting to discuss and prioritize future projects.

The general manager of the company oversees the implementation of all energy savings projects and measures. Additionally, the management system model of continuous improvement that was previously established for ISO 9001 and ISO 14001 compliance has been extended to also include ISO 50001. A corporate-wide ISO compliance office tracks all key performance indicators and aids each department with analyzing their processes to look for areas of optimization.

With this level of integration into the organization, energy management is not an afterthought, but business as usual.

Energy review and planning

One of the items reviewed at the monthly Engineering Steering Committee Meeting are KPIs produced by the ISO compliance office. This allows the steering committee to easily identify which projects are driving the desired effect and where there are areas for improvement. Minor changes to the overall strategy are made on a monthly basis and major revisions are made on an annual basis in order to meet energy savings targets set by the government.

As with all technology, newer energy management technology constantly becomes available. Working groups chartered by the steering committee constantly evaluate these new technologies to determine the feasibility of their application and potential energy savings. As appropriate, newer energy management technologies are incorporated into the strategic plans after a pilot project proves successful.

Corporate goals are also aligned with energy savings targets. While basic goals may be set to align with governmental guidelines such as the Long Term Energy Savings Plan of the Guangdong Province (2020), aggressive stretch goals created by reviewing international benchmarks are also put in place to further motivate all the departments in the company to work together as a team to achieve energy savings. Because of this, one of the key internal KPIs measures the amount of energy consumed to perform a unit of fabric.

Since employee performance appraisals are based on corporate goals, the energy management system is directly tied to employee compensation. Not only are employees motivated to meet conservation goals, they are strongly motivated to exceed them to unlock annual bonuses tied to the stretch goals. As a major player in the global textiles industry, setting goals that exceed global conservation benchmarks will have a meaningful and significant impact on society.

Cost-benefits analysis

Conservation is a fundamental tenant of Pacific Textiles. As a result, implementing the energy management system in accordance with ISO 50001 only required minor process adjustments and the addition of new staff to drive these enhanced processes. This was only possible since GB/T23331 was already implemented. Most of the costs related to the implementation of the energy management system are maintenance related.

Total energy cost savings: \$4,890,633 USD

Cost to implement EnMS: \$776,985 USD

Payback period (years): 0.8

Approach adopted to evaluate energy performance

An Energy Monitoring and Measurement procedure that implements three key processes has been established as part of the EnMS. The first process is the collection of energy consumption data from various systems around the company. The second process analyzes the data collected to produce statistics analyzing energy efficiency and these reports are distributed to the relevant personnel. The third process provides real-time data so that system settings can be adjusted as required.

Data is collected from key systems around the company, including components of the power plant, the air conditioning control system, and energy consumption meters installed in the plant. For the power plant, the combination of an air compressor and air blower are required to guarantee uninterrupted emissions control. As these systems are constantly running, highly efficient systems increase the energy conservation and help to dramatically reduce pollution to the environment.

Analysis of energy consumption starts with identifying the systems and departments that consume the largest amounts of energy. Following that analysis, progress towards achieving energy savings targets is assessed and reviewed.

The company's SAP ERP system also aides in the collection of material consumption information to assist with energy consumption analysis.

Approach used to validate results

The Three Lines of Defense model is used to perform validation, with each department performing an initial audit of their energy consumption on a monthly basis. The ISO compliance office, which is composed of highly trained personnel, also performs annual internal audits as a second level of validation. Lastly, external auditors are engaged annually to perform audits. A long-standing relationship with BSI has been established. Additionally, industry experts are invited to periodically audit the energy consumption reports as well. For example, in March 2013, the China National Textile and Apparel Council organized a team of 34 experts to audit the energy utilization status of Pacific Textiles.

Steps taken to maintain operational control and sustain energy performance improvement

The last phase of the plan-do-check-act/adjust (PDCA) management model is to compare validated results with the original baseline. If the validated results are better than the original baseline, then the new validated results become the new baseline for how the organization behaves.

“Implementing cleaner production is like running a marathon. It takes significant perseverance and commitment, however the rewards are great.”

—Wan Wai Loi, Chairman and CEO

Development and use of professional expertise, training, and communications

ISO 50001 shares training requirements that are similar to ISO 9001 and ISO 14001. Therefore, implementing the training requirements for ISO 50001 only required the development of new training courses for employees. Just as with the other ISO standards, employees are trained such that they understand the importance of their activities and how they contribute towards the energy management strategy of the company. The Human Resources department maintains detailed records of employee education, training, skills, and experience.

In addition to the ISO requirements, employees are also provided with management training to empower them to make decisions and sharpen their leadership skills. Even though the entire management chain is involved in energy management, the organization is too large for the senior executives to be involved in every single decision. This training will help to establish a sustainable organization. The internal company newspaper also helps to publicize the company's energy management achievements and encourages employees to think about conservation in their personal lives as well.

Tools & Resources

Energy management does not just rely on newer energy management technology or frameworks. Pacific Textiles focuses on continuously improving performance by using methodologies such as Lean Six Sigma, 5S, and Kaizen. Furthermore, operations procedures, training materials, and corporate standards all reside in the enterprise knowledge management system.

Local organizations also provide Pacific Textiles with a significant number of resources ranging from industry best practices to cutting edge research. Some of the organizations that are routinely consulted include: Hong Kong Productivity Council (HKPC); Guangzhou Institute of Energy Conversion, Chinese Academy of Sciences (GIEC); Guangdong Provincial Cleaner Production Association; Technical Alliance for Energy Saving and Emission

Reduction of National Textile Industry; Guangzhou Institute branch of Shenyang Automation, Chinese Academy of Sciences; and the China National Institute of Standardization.

Future EnMS Enhancements

As one of the largest textiles mills in the world, Pacific Textiles has invested significantly in the infrastructure required to support all the production processes required to produce fabric for leading fashion brands. This has resulted in the construction and management of power generation and water treatment plants. The scale of the plant makes it perfect for conducting experiments in conservation.

In mid-2017, the New Energy and Industrial Technology Development Organization (NEDO), Japan's largest public management organization promoting research and development as well as deployment of industrial, energy, and environmental technologies, and the National Development and Reform Commission of the People's Republic of China (NDRC) selected Pacific Textiles as the recipient of a grant amounting to \$900 million JPY. During the next three years, working in conjunction with the Japan Research Institute (JRI), Tokyo Electric Power Company (TEPCO), Yokogawa Electric Corporation, and the China Southern Power Grid Company, Pacific Textiles will implement a smart manufacturing project that will feed into a larger smart grid project. The goal of this project is to be able to optimize and level out the energy usage patterns so that fossil fuel used in power generation can be decreased further.

In late 2017, the company was selected for a solar panel project sponsored by the NDRC. 5.5 megawatts of photovoltaic capacity will be installed at the factory, which could potentially offset 13% of the power generation capacity of the existing power plant. The cost of construction for this project will be approximately \$35 million CNY, which will be entirely paid for by a solar management company. Pacific Textiles will receive a one-time payment for use of its facilities and be able to

purchase power from the solar arrays at a discounted rate for the next two decades. Following the 20 year period, the ownership of the solar array will be transferred to Pacific Textiles.

These two projects show Pacific Textiles' continuing commitment to energy management and international recognition of the company's leadership role in conservation.

Lessons Learned

Executive sponsorship is critical for implementing any program, especially energy management. However, executive participation – especially leading steering committee meetings – makes implementation even more effective.

Clear goals and well-defined benchmarks which are aligned to international standards anchor the goals to easy to understand concepts. Implement the plan-do-check-act/adjust methodology as part of ISO standards compliance for continuous improvement.

Consult with local industry trade groups, universities, non-governmental organizations, and governmental organizations for best practices and help with identifying areas for improvement. Do not be afraid to innovate or crowd source ideas from employees.

Actively test and run proof of concept projects using the latest energy conservation technologies. Implement technologies that are foundational in nature or help to exceed energy conservation goals.

Align corporate objectives with energy management objectives and ensure that employee appraisals use those goals.

Keys to Success

- Executive sponsorship from the highest levels is critical for any program implementation.
- Set clear goals and well-defined benchmarks. Follow the PDCA management methodology for continuous improvement.
- Consult with outside experts to learn best practices and identify areas for improvement.
- Actively adopt new energy-savings technologies.
- Perform training and align employee incentives with energy management to increase employee engagement.



Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit www.cleanenergyministerial.org/energymanagement.

